



Export sophistication and economic growth: Evidence from China[☆]

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ABSTRACT

We consider the effect of export sophistication on economic performance by appealing to regional variation within one single country (China) over the 1997–2009 period. We find evidence in support of Hausmann, Hwang and Rodrik (2007), in that regions specializing in more sophisticated goods subsequently grow faster. We find substantial variation in export sophistication at the province and prefecture level, controlling for the level of development, and that this sophistication in turn drives growth. Our results suggest that these gains are limited to the ordinary export activities undertaken by domestic firms: no direct gains result from either processing trade activities or foreign firms, even though these are the main contributors to the global upgrading of China's exports. As such, the extent of assembly trade and foreign entities should be distinguished in order to measure the true movement in a country's technology and the contribution of exports to economic growth.

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1. Introduction

Since the early 1990s, China has integrated into world trade at an astounding pace. Chinese exports more than quintupled between 1992 and 2007, growing faster than the national economy. The functioning of China's economy has been radically transformed, moving from an isolated position with exports of less than 10% of GDP in 1980 to a highly-integrated economy, with an export ratio of more than 37% in 2007. This process has been accompanied by a no less impressive diversification of China's trade, as its manufactured exports pervaded all sectors of world trade, from low-technology textiles to high-tech electronics and computers.

A number of aspects of this trade integration have however puzzled economists. One is the rapid *upgrading* of China's exports: economists (and world consumers) have noticed the impressively broad range of China's export products since the mid-nineties, and in particular, the ability of Chinese producers to export capital- and skill-intensive products, high-technology products, and in general products that are

usually considered as belonging to the area of specialization of more developed countries. Rodrik (2006) notes that China is an outlier regarding the overall *sophistication* of its exports: according to the sophistication index of Hausmann et al. (2007), which estimates the average “income level of a country's exports”, China's export bundle is similar to that of a country with a level of income per-capita three times larger than China. Using an alternative indicator, Schott (2008) also finds that China's export bundle is increasingly overlapping with that of the world's most-developed economies, and that this overlap cannot be entirely explained by factor endowments.¹

This phenomenon has given rise to two related debates in the literature. The first asks whether this discrepancy between China's export structure and its level of development (sometimes called the “China-is-special” result) is an artifact due to the improper measurement of export sophistication.² The second considers the potential contribution of export upgrading to China's real growth. We here rely on detailed trade data at the sub-national level in China over the 1997–2009 period to investigate these two related issues empirically.

A number of researchers have questioned the claim made in Rodrik (2006) and Schott (2008) that there is something special about Chinese exports. The importance of processing trade³ in China's

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¹ See also Fontagné et al. (2008).

² We are grateful to an anonymous referee for pointing out the relevance of this literature.

³ The terms ‘processing’, or ‘assembly’, trade are used interchangeably to refer to the operations of firms which import inputs in order to assemble them in China and re-export the finished products.

export sector is one possible reason for the overvaluation of Chinese exports' sophistication, as many of the high-technology goods exported by China are produced using labor-intensive processes and imported inputs. The sophistication of these exports thus includes the technology embedded in the imported inputs, and not necessarily any greater degree of complexity or technology in the Chinese final assembly process. Moreover, a considerable share of high-technology exports comes from partially or wholly foreign-owned firms (mainly operating in the assembly-trade sector): this raises the question of whether the observed upgrading of Chinese exports reflects the genuine adoption of technology at the local level (Amiti and Freund, 2010; Lardy, 2005; Lemoine and Ünal-Kesenci, 2004; Wang and Wei, 2010). These concerns are backed up by statistics on Chinese trade. In 2007, 54% of Chinese exports were in the processing trade sector; the analogous figure is 85% for high-technology exports. Processing trade activities are also dominated by foreign entities: in 2007, 82% of processing-trade exports, and 91% of high-tech processing-trade exports, came from foreign firms. Koopmans et al. (2008) develop a general formula for computing the domestic and foreign components of pervasive processing-trade exports, and calculate that the foreign share of value-added in China's exports is around 50%, which is far higher than in most other countries.⁴ They also find that this foreign content is higher in more sophisticated sectors, such as electronic devices and telecommunication equipment (about 80%). Yao (2009) argues that once China's processing-trade regime is taken into account, Chinese exports no longer look very different from those in other countries with similar levels of development, a point also made by Van Assche and Gangnes (2010). It is in addition underlined that the uneven distribution of income, and of exports, across China's provinces should be taken into consideration when establishing any "China-is-special" phenomenon. In China, the provinces that export the most, and the most sophisticated products, are also the richest: there thus may not be much of a gap between income levels and export sophistication if we look at province-level data (see e.g. Xu, 2010).

The second related debate refers to the contribution of export upgrading to China's growth. Theoretically, this is linked to the question of whether reshaping the structure of production beyond the boundaries established by factor endowments (physical and human capital, and natural resources) yields any growth benefits. Standard trade theory with its focus on comparative advantage would answer in the negative. However, a considerable theoretical literature based on endogenous growth has proposed models which go beyond this standard framework to show that production structure is a crucial determinant of economic performance.⁵ These models consider the process of learning and the adoption of new technologies as being costly. In this framework, beyond specializing in the sectors with comparative advantage, there are additional gains to specializing in products with greater positive externalities. Policies which favor this discovery process, such as encouraging technological learning and technology imports, may lead to higher growth rates. Empirical support for this hypothesis has recently been provided by Hausmann et al. (2007), who use cross-country panel regressions to show that countries acquiring the capability to export more sophisticated goods grow faster, controlling for initial income levels and factor endowments. They hence argue that "what a country exports matters".

The measurement of China's export upgrading and its impact on growth are closely related. If indeed, as argued by many, this upgrading can be entirely attributed to the assembly sector, then we may expect the "China-is-special" result to break down, once we distinguish processing from non-processing exports. If, in addition, the sophistication of Chinese

exports reflects regional differences in income, then export sophistication may have no additional predictive power with respect to the real growth rates of provinces, once initial levels of income have been controlled for.

We here use sub-national trade data differentiating between processing trade and ordinary (i.e. non-processing) trade, as well as between exports by domestic and foreign-owned firms, and contribute to the literature in three different ways.

We first estimate the upgrading of China's exports by measuring export sophistication separately for ordinary and processing-trade transactions and for domestic and foreign firms.⁶ This decomposition shows that almost three quarters of China's export sophistication growth can be attributed to processing trade, in line with previous findings (Amiti and Freund, 2010; Lemoine and Ünal-Kesenci, 2004; Wang and Wei, 2010). In addition, virtually all of processing-trade's contribution to China's export sophistication came from foreign firms. We however find that the recent upgrading of China's trade has also involved domestic producers, and especially their ordinary trade activities which account for the remaining quarter of this growth. The per capita income level associated with exports by domestic entities increased by 15.5% between 1997 and 2007 to reach a figure of 12,500\$, similar to that in Lithuania, a country which is three times richer than China in PPP per capita terms. This figure remains however lower than that of foreign entities, which rose by 25.7% over the period to reach 15,776\$, a figure similar to that in the UK, a country seven times richer than China in PPP per capita terms. Second, we estimate the relationship between export sophistication and real growth in China. As we rely on regional variations within a single country (China), we provide a test of Hausmann et al. (2007) model relating production structure to economic growth, with the advantage that, by comparing China's provinces, we can mitigate the problems of omitted variables related to different legal and institutional systems that arise in cross-country analysis. The cross-country empirical patterns found in Hausmann et al. (2007) continue to hold across the regions within China. We thus confirm the validity of Hausmann et al. (2007) in the Chinese context: regions specializing in sophisticated goods grow faster. Our results contrast with the criticisms of Yao (2009) and Xu (2010) by showing that, even at the sub-national level, export sophistication varies substantially, controlling for income, and that this difference in turn matters for growth. The relation of export sophistication to growth is robust to a number of sensitivity checks, and is not restricted to locations that are heavier exporters.

Third, we investigate whether the relationship between export sophistication and income per capita growth depends on the trade regime (processing or ordinary) and ownership type (domestic or foreign) of exporting firms. We find that export sophistication in the assembly sector bears no relation to real growth: export upgrading in this sector should therefore not be taken as a signal of Chinese technology adoption, but rather as an artifact due to China's role in the increasing international fragmentation of production. The contribution of assembly exports to the upgrading of China's exports should thus be put to one side for the measurement of the real improvement in the country's level of technology.

More precisely, we find that growth-enhancement is limited to the ordinary export activities of domestic entities: no additional direct benefits pertain from the upgrading of foreign exporters, either in assembly or ordinary exports. This has important implications for China. The country adopted, starting in the early 1980s, a policy of opening to foreign investment, precisely in the hope that technological capabilities and management practices would spill over and bring about greater productivity and export performance and sustain higher growth rates. These policies were believed by many to be the key factor explaining

⁴ Their estimated value is almost twice as high as that from the traditional formula in Hummels et al. (2001).

⁵ See amongst others Aghion and Howitt (1998), Hausman and Rodrik (2003), Stokey (1988) and Young (1991).

⁶ Here and in the rest of the article, we define "foreign firms" as those with some foreign capital ownership: i.e. wholly foreign-owned firms as well as joint ventures (this latter including equity and non-equity joint ventures, and joint cooperatives).

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